

इंटरनेट

मानक

### Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 12048 (1987): Helically formed fittings for overhead lines upto 33 kV [ETD 37: Conductors and Accessories for Overhead Lines]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”



BLANK PAGE



IS : 12048 - 1987

# *Indian Standard*

## SPECIFICATION FOR HELICALLY FORMED FITTINGS FOR OVERHEAD LINES UP TO 33 kV

UDC 621.315.171 : 621.315.65

© Copyright 1988

**BUREAU OF INDIAN STANDARDS**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

**AMENDMENT NO. 1   APRIL   2000**  
**TO**  
**IS 12048 : 1987   SPECIFICATION FOR**  
**HELICALLY FORMED FITTINGS FOR OVERHEAD**  
**LINES UP TO 33 kV**

*(Page 4, clause 2.2)* — Delete and renumber the rest.

*(Page 4, clause 3.0.3, line 1)* — Substitute 'rods/wires' *for* 'rods and wires'.

*(Page 5, clause 3.1.2, line 2)* — Substitute 'rods/wires' *for* 'rods'.

*(Page 6, clause 3.1.5, line 1)* — Substitute 'rods/wires' *for* 'rods'.

*(Page 7, clause 3.2.3.1, line 3)* — Substitute 'rods/wires' *for* 'rods'.

*(Page 8, clause 3.2.7, line 1)* — Substitute 'rods/wires' *for* 'rods'.

*(Page 8, clause 5.1, line 2 and 3)* — Substitute 'stay strands' *for* 'steel strands', and 'rods/wires' *for* 'rods'.

*(Page 11, clause 7.4.1, line 4)* — Substitute 'rods/wires' *for* 'rods'.

(ETD 37)

# *Indian Standard*

## SPECIFICATION FOR HELICALLY FORMED FITTINGS FOR OVERHEAD LINES UP TO 33 kV

Conductors and Accessories for Overhead Lines Sectional Committee,  
ETDC 60

### *Chairman*

SHRI R. D. JAIN

### *Representing*

Rural Electrification Corporation Ltd, New Delhi

### *Members*

SHRI G. L. DUA ( <i>Alternate to</i> Shri R. D. Jain)	
SHRI K. K. AGARWAL	Research, Designs and Standards Organization (Department of Railways), Lucknow
DEPUTY DIRECTOR (OHE) - 1 ( <i>Alternate</i> )	
SHRI V. P. ANAND	Electrical Manufacturing Co Ltd, Calcutta
SHRI S. C. MALHOTRA ( <i>Alternate</i> )	
SHRI R. S. ARORA	Directorate General of Supplies and Disposals, New Delhi
SHRI J. S. PASSI ( <i>Alternate</i> )	
SHRI R. T. CHARI	Tag Corporation, Madras
DR P. R. MADHAVAN ( <i>Alternate</i> )	
SHRI R. S. CHAWLA	Industrial Fasteners and Gujarat Pvt Ltd, Vadodara
SHRI D. S. BHULLAR ( <i>Alternate</i> )	
DIRECTOR (TRANSMISSION)	Central Electricity Authority (Transmission Directorate), New Delhi
DEPUTY DIRECTOR (TRANSMISSION) ( <i>Alternate</i> )	
SHRI M. R. DOCTOR	Special Steels Ltd, Bombay
SHRI V. C. TRICKUR ( <i>Alternate</i> )	
GENERAL MANAGER (Q/A)	Indian Posts and Telegraphs (Department of Telecommunications), New Delhi
DIVISIONAL ENGINEER (TELE C/P) ( <i>Alternate</i> )	
SHRI S. GOPALAKRISHNAN	Aluminium Industries Ltd, Kundara
SHRI P. LABOI ( <i>Alternate</i> )	

(Continued on page 2)

© Copyright 1988

BUREAU OF INDIAN STANDARDS

This publication is protected under the *Indian Copyright Act* (XIV of 1957) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

## (Continued from page 1)

## Representing

*Secretary*

Panel for Helically Formed Fittings for Conductors, ETDC 60 : P3

SHRI G. L. DUA Rural Electrification Corporation Ltd, New  
Delhi

SHRI V. P. ANAND Electrical Manufacturing Co Ltd, Calcutta  
SHRI S. C. MALHOTRA (*Alternate*)

(Continued on page 18)

# *Indian Standard*

## SPECIFICATION FOR HELICALLY FORMED FITTINGS FOR OVERHEAD LINES UP TO 33 kV

### 0. FOREWORD

**0.1** This Indian Standard was adopted by the Bureau of Indian Standards on 28 April 1987, after the draft finalized by the Conductors and Accessories for Overhead Lines Sectional Committee had been approved by the Electrotechnical Division Council.

**0.2** Helically formed fittings are intended for use on overhead line conductors/cables, earth wires and stay wires for various applications like dead ending, insulator tying, jointing, repairing and tapping.

**0.3** The specification mainly covers the following types of helically formed fittings:

- a) Conductor dead end grips,
- b) Insulator ties,
- c) Conductor splices,
- d) Guy grip dead ends,
- e) Tap connectors,
- f) Service grip dead ends, and
- g) Lashing rods.

**0.3.1** Some examples of use of helically formed fittings for the above applications have been illustrated in Appendix A.

**0.4** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

---

\*Rules for rounding off numerical values (*revised*).



## 1. SCOPE

**1.1** This standard specifies the requirements and tests for helically formed fittings for use on overhead power lines up to 33 kV.

## 2. TERMINOLOGY

**2.0** For the purpose of this standard, the following definitions shall apply.

**2.1 Failing Load** — The maximum load which can be applied to a fitting under the prescribed conditions of test.

**2.2 Flattening** — Flattening of formed wires is defined as the difference between the largest and the smallest diameter at the given point.

**2.3 Type Test** — Test intended to prove that the quality and design of a given type of article are in accordance with the specification.

**2.4 Acceptance Tests** — Tests carried out on samples taken from a lot for the purpose of acceptance of the lot.

**2.5 Routine Tests** — Tests carried out on each fitting to check the requirements which are likely to vary during production.

## 3. CONSTRUCTION AND GENERAL REQUIREMENTS

### 3.0 General

**3.0.1** Aluminium alloy, aluminized steel, aluminium clad steel and galvanized steel wires having required mechanical strength, corrosion resistance and formability, depending on the types of applications, shall be employed in the manufacturing of the fittings.

**3.0.2** Parts of the fittings made out of die cast aluminium alloy shall be manufactured with alloy A6 designation of IS : 617-1975\*.

**3.0.3** In case of rods and wires, no joint shall be permitted except those in the base rod or wire before final drawing.

**3.0.4** Nuts and bolts used shall be of steel conforming to IS : 1364-1967† and cottor pins conforming to IS : 2004-1978‡.

---

\*Specification for aluminium and aluminium alloy ingots and casting for general engineering purposes (*second revision*).

†Specification for precision and semi-precision hexagon bolts, screws, nuts and lock nuts (diameter range 6 to 39 mm) (*first revision*).

‡Specification for carbon steel forgings for general engineering purposes (*second revision*).

### 3.1 General Reauirements for Construction

**3.1.1** Formed helical fittings are factory formed fittings of definite size and made of suitable material, compatible with the conductor on which they are applied, that is, aluminium alloy, aluminized steel, aluminium clad steel fittings for aluminium based conductors and galvanized steel fitting for steel conductors. Such fittings are formed in spiral shape to make them convenient to be applied on the conductor without excessive clamping pressure at any one point. The parameters of these formed fittings are designed to suit the specific size of the conductor and hardware with which these are used.

**3.1.2** Wherever required, suitable gritting shall be applied to the gripping section of the formed fittings except for lashing rods in order to enhance their gripping strength and conductivity.

**3.1.3** End of the formed fittings shall be suitably deburred so as to prevent damage to the conductor.

**3.1.4** Each formed set shall be marked with an indelible and distinct type of colour code to facilitate its identification and application on the conductor. In addition, conductor dead end and guy grip dead end shall have cross-over mark to indicate the starting to application point.

**3.1.4.1** The following colour code shall be used for the tag and also for the starting/cross-over marks for quick identification:

<i>Conductor Size</i> mm <sup>2</sup>		<i>Colour Code</i>
20	} For 11 kV	Blue
25		Blue
30		Red
50	} For 33 kV	Yellow
80		Brown
100		Violet

#### *GI Wire*

Guy grip for 7/3.15 mm stay wire	Green
Guy grip for 7/2.5 mm stay wire	Black

NOTE — Colour codes for other types of conductors will be added later. Till such time, the colour codes for conductors not covered by above may be decided upon by mutual agreement between the manufacturer and the purchaser.

**3.1.4.2** A PVC/metallic tag shall be provided on each fitting to facilitate its identification and application.

**3.1.5** The diameter and number of formed rods used per set of formed fitting shall be according to the manufacturer's drawings duly approved by the purchaser.

## **3.2 General Requirements for Formed Product Used in Fittings for Various Applications**

### **3.2.1 Conductor Dead End Fittings for H. T. Lines**

**3.2.1.1** Formed conductor dead end fittings for use with disc insulator of clevis and tongue type consists of the following parts:

- a) A cross arm strap conforming to IS : 2486 (Part 2)-1974\*.
- b) Aluminium alloy die cast thimble clevis for attaching to the tongue of disc insulators on one end and for accomodating the loop of the helically formed dead end at the other end in its smooth internal contour. The size of the thimble shall be suitable for all sizes of conductors indicated in **3.1.4.1**. This thimble clevis is attached to the insulator through a steel cotter pin used with a non-ferrous split pin of brass or stainless steel. The thimble clevis should have clevis dimensions according to IS : 2486 (Part 2)-1974\*; and
- c) Helically formed dead end grip having a pre-fabricated loop to fit into the grooved contour of the thimble on one end and for application over the conductor at the other end.

**3.2.1.2** Helically formed conductor dead end fittings for use with disc insulator of ball and socket type, consists of the following parts:

- a) A cross arm strap conforming to IS : 2486 (Part 2)-1974\*.
- b) Forged steel ball eye or ball clevis for attaching to the socket end of the disc insulator. Forging shall be made in steel according to IS : 2004-1978†.
- c) Aluminium alloy socket thimble made out of permanent mould cast high strength aluminium alloy for attaching to the disc insulators on one end and for accomodating the loop of the

---

\*Specification for insulator fittings for overhead power lines with a nominal voltages greater than 1000 V : Part 2 Dimensional requirements (*first revision*).

†Specification for carbon steel forgings for general engineering purposes (*second revision*).

helically formed dead end at the other end in its smooth internal contour. This socket thimble is attached to the disc insulator with the help of locking pin according to the dimensions provided in IS : 2486(Part 3)-1974\*.

d) According to 3.2.1.1(c).

**3.2.1.3 Conductor dead end fittings for LT lines** — Helically formed fittings for low tension lines consist of helically formed dead ends which can be attached directly to LT insulator on one end and to conductor on the other end. No other hardware is needed.

**3.2.2 Insulator Ties** — Insulator ties are helically formed fittings used to support and secure the conductor to the insulator.

**3.2.2.1** Helically formed ties, used for securing the conductor on pin insulator, shall be of a material compatible with the conductor material and dimensions conforming to the drawings agreed between the purchaser and the supplier.

NOTE — The formed fittings are suitable only for a particular shape and size of neck/groove of the insulator. Necessary information in this regard shall be made available to the manufacturer by the purchaser.

**3.2.2.2** Elastomer tie pad for insulator shall be used with the formed ties to avoid abrasion of the conductor and to prevent conductor coming into direct contact with the insulator.

### 3.2.3 Conductor Splices

**3.2.3.1 Full tension splices** — Conductor splices for ACSR conductors consist of steel core splice for steel strands and aluminium alloy splice for outer aluminium strands. Aluminium alloy filler rods may be used, wherever required. In the case of GI earth wire, splices shall be made of suitable GI wire. For AA/AAA conductor, splices made of aluminium alloy shall only be used.

**3.2.3.2 Repair splices** — Non-tension splices are used where steel core is intact but not more than one-sixth of the strands in the outermost layer have been severed. Such joints shall satisfy the electrical requirements of the conductor.

**3.2.4 Guy Grip Dead Ends** — Guy grip dead ends are applied on one side of the thimble attached to the bow of the stay rod and on the other side to the guy wire. These can be used directly with guy insulators also.

---

\*Specification for insulator fittings for overhead power lines with a nominal voltages greater than 1 000 V: Part 3 Locking devices.

## IS : 12048 - 1987

**3.2.5 Tap Connectors** — Tap connectors consist of aluminium alloy wires and are used as standard tap connectors, and for tapping branch lines/services from the main conductor. Sizes of the main and the tap conductor/cable shall be specified by the purchaser.

**3.2.6 Service Grip Dead End** — Service grip dead ends are used for the termination of messenger wire of the service cable. The fitting shall be applied to the shackle insulator or reel attached to the pole.

**3.2.7 Lashing Rods** — Lashing rods are helically formed fittings used to secure service cables on to the messenger wire.

## 4. MATERIAL

**4.1** Materials of the wires used in the manufacture of the fittings shall have the dimensional, mechanical and electrical properties as specified in the following clauses.

**4.1.1** Aluminium alloy wires conforming to IS : 398 (Part 4)-1979\*.

**4.1.2** Aluminized steel wires conforming to IS : 3835-1966†.

**4.1.3** Aluminium clad wires (*requirements under consideration*).

NOTE — At present there is no Indian Standard for aluminium clad wires. Till such time, the material requirements for these types of wires shall be mutually decided upon by the supplier and the purchaser.

**4.1.4** Galvanized steel wires conforming to IS : 398 (Part 2)-1979‡.

**4.1.5** Materials used for chloroprene pad shall have the properties specified in Table 1.

## 5. DIRECTION OF LAY

**5.1** The lay of helix for formed fittings shall be right hand in line with the standard practice for outer stranding of the conductor or steel strands, to which it is applied. The rods shall be subsequently cut to size in uniform lengths. Number of each rods which form a set shall be taped together for application on the conductor.

---

\*Specification for aluminium conductors for overhead transmission purposes: Part 4 Aluminium alloy stranded conductors (aluminium-magnesium-silicon type) (*second revision*).

†Specification for aluminized steel core wire for aluminium conductors (ACSR).

‡Specification for aluminium conductors for overhead transmission purposes: Part 2 Aluminium conductors, galvanized steel reinforced (*second revision*).

**TABLE 1 PROPERTIES FOR ELASTOMER PAD**

(Clause 4.1.5)

1. a) Tensile strength	Minimum 140 kg/cm <sup>2</sup>
b) Tensile strength (after ageing)	Not less than 85 percent of the test value obtained in 1 (a)
2. a) Elongation	300 percent
b) Elongation (after ageing)	Not less than 60 percent of the test value obtained in 2 (a).
3. a) Shore hardness, A (before ageing)	70 ± 5
b) Shore hardness (after ageing)	Not more than 15 percent of the test value obtained in 3 (a).

NOTE — Ageing should be carried out for 70 hours at 100°C.

4. Compression set	50 percent maximum [test to be done in accordance with IS : 3400 (Part 10)-1977*]
--------------------	---

\*Methods of test for vulcanized rubber: Part 10 Compression set at constant strain (first revision).

## 6. PACKING AND MARKING

**6.1** Helically formed fittings shall be packed suitably in cartons. For the purposes of safe transportation, the cartons shall be packed in wooden crates.

**6.2** The packings of the fittings should carry the following information:

- Manufacturer's name and trade-mark;
- Size of conductor and numbers;
- Name of the purchaser;
- Batch No., date, month and year of manufacture; and
- Any other markings agreed to between the manufacturer and the purchaser.

**6.3** The fitting may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made there-under. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions, under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

## 7. TESTS

### 7.1 Classification of Tests

7.1.1 *Type Tests* — The following shall constitute the type tests:

	<i>Applicable to</i>
a) Visual examination ( <i>see 7.2</i> )	All fittings
b) Verification of dimensions ( <i>see 7.3</i> )	All fittings
c) Tensile strength test on finished products ( <i>see 7.4</i> )	All fittings
d) Electrical resistance test ( <i>see 7.5</i> )	All aluminium alloy fittings
e) Wrapping test ( <i>see 7.6</i> )	All fittings
f) Slip strength test ( <i>see 7.7</i> )	Conductor dead ends, guy grips and splices
g) Resilience test ( <i>see 7.8</i> )	Conductor dead ends, guy grips and conductor splices
h) Unbalanced load test ( <i>see 7.9</i> )	Ties only
j) Fatigue test ( <i>see 7.10</i> )	Conductor dead ends, ties and splices
k) Galvanization test ( <i>see 7.11</i> )	Hardwares and fittings using GI wires
m) Pull-off strength test ( <i>see 7.12</i> )	Distribution ties
n) Electrical and mechanical test ( <i>see 7.13</i> )	Tap connectors
p) Test on elastomer pads ( <i>see Table 1</i> )	Elastomer pads

The manufacturer shall submit not less than 3 samples identical in all respects for carrying out type tests with the test certificate giving material and dimensional details of the products.

### 7.1.2 *Acceptance Tests*

7.1.2.1 The followings shall constitute the acceptance tests:

- Visual examination (*see 7.2*),
- Verification of dimension (*see 7.3*),
- Tensile strength test (*see 7.4*),
- Electrical resistance test (*see 7.5*),

- e) Wrapping test (*see 7.6*),
- f) Slip strength test (*see 7.7*),
- g) Resilience test (*see 7.8*),
- h) Unbalanced load test (*see 7.9*),
- j) Galvanization test (*see 7.11*),
- k) Pull-off strength (*see 7.12*), and
- m) Electrical and mechanical tests on tap connectors (*see 7.13*).

**7.1.2.2** The tests prescribed in **4.1** should be adopted as acceptance tests on the individual wires used in making the helically formed fittings.

**7.1.2.3** The sampling procedure and criteria of acceptance shall be subject to agreement between the supplier and the purchaser. In the absence of such an agreement, the sampling procedure detailed in Appendix B may be followed.

### **7.1.3 Routine Tests**

**7.1.3.1** The following shall constitute the routine tests:

- a) Visual examination (*see 7.2*), and
- b) Verification of dimensions (*see 7.3*).

**7.2 Visual Examination** — All fittings shall be checked visually for good workmanship and smooth finish.

**7.3 Verification of Dimensions** — The dimensions shall be checked in accordance with the approved drawings and the dimensional requirements specified in the respective standards for wires.

### **7.4 Tensile Strength Test**

**7.4.1** Helically formed wires shall be straightened by light hammering and tested for tensile strength on a suitable tensile machine. The tensile strength test shall be carried out according to the method specified in the respective standards for wires. The tensile strength of the formed rods shall not be less than that of the specified values.

**7.4.2 For Thimbles and other than Formed Fittings** — The dead end clevis thimble or socket thimbles and the straps or the straps with ball eyes shall be tested for this test in accordance with the requirements of the mechanical falling load of IS : 2486 (Part 1) - 1971\*.

---

\*Specification for insulator fittings for overhead power lines with a nominal voltages greater than 1 000V: Part 1 General requirements and tests (*first revision*).



**7.5 Electrical Resistance Test** — This test shall be done on straightened aluminium alloy formed wires according to IS : 2121 (Part 1) - 1981.\* The conductivity of the same should not be less than 39 percent IACS.

**7.6 Wrapping Test** — The formed fittings made of aluminium alloy wires should be wrapped on a wire of its own diameter to form a close helix. This test should conform to the requirements specified in the respective standards mentioned in 4.1. The wires should not break or show fracture when tested as above.

### 7.7 Skip Strength Test

**7.7.1** A set of dead end fittings shall be applied to the specified conductor as near as possible to the working conditions. A tensile load of 50 percent of the breaking load of the conductor shall be applied and the conductor shall be marked in such a way that movement relative to the clamp can be easily detected. Without subsequent adjustment, the load should be steadily increased till the load at which the movement of the fitting relative to the conductor is noticed, should be noted. Helically formed dead end should withstand guaranteed load when the load is maintained for one minute. Guaranteed load should not be less than the breaking strength of the conductor according to the following values:

85 percent	ACSR
90 percent	Aluminium alloy, all aluminium conductors and conductors splices (according to IS : 2121 (Part 1) -1981*)
100 percent	Guy grip
50 percent	Low tension dead ends and service grips.

However, in case of ACSR conductor, the formed dead end should not allow the conductor to slip before it yields.

**7.8 Resilience Test** — This test shall be carried out on dead ends and splices only.

**7.8.1** A set of helically formed fittings are wrapped and unwrapped on a piece of conductor 3 times successively. The helical fitting should not lose its resilience even after 3 applications and should be able to pass the slip strength test requirements mentioned in 7.7 thereafter.

---

\*Specification for conductors and earth wires accessories for overhead power lines: Part 1 Armour rods, binding wires and tapes (*first revision*).

**7.9 Unbalanced Holding Strength Test** — The test is intended to simulate the broken-wire condition. A span of minimum 20 metres tensioned for 35 percent of UTS of the conductor shall be erected in the laboratory and a pin insulator along with the insulator tie under test shall be applied in the middle of the span. The conductor used for this purpose shall be of specific size with which the insulator tie is to be used. The test set up shall be such that it should be possible to apply a pull on one of the two dead ends of the conductor. For the purpose of this test, a steel replica of the insulator shall be used.

During the test, tension on one side of the pin insulator shall be suddenly released and effect observed. No slippage or damage to the fitting shall occur. After releasing tension from the other end, the fitting should retain the original form. This test will not only check the unbalanced holding strength of the fitting but will also prove the resilience of the fitting in the event of broken wire condition.

The test shall be repeated. After releasing the conductor tension on one side, pulling force shall be slowly applied on the other dead end to pull the conductor till slippage/damage occurs. This force shall not be less than 320 kg.

**7.10 Fatigue Test** — This test shall be carried out on all types of fittings except lashing rods and tap connectors.

**7.10.1** Fittings should be subjected to fatigue test along with the conductor by imparting ten million cycles of peak amplitudes at a frequency above 30 cycles/second for a minimum span length of 30 metres, at the everyday tension of the conductor. The amplitude of the vibration at antinodal points shall not be less than 50 percent of the diameter of the conductor, with the conductor having a tension equal to 40 percent of its UTS. The test should be carried out for 10 million cycles after which the conductor fitting and insulator should be examined.

There should be no damage to the conductor where the fitting is attached to the conductor or the insulator. The fitting should be able to withstand the test without any damage. The conductor and the insulator should be examined which should show no damage.

**7.11 Galvanizing Test** — Galvanizing test shall be carried out on the hardwares and fittings using GI wires. Test shall be carried out in accordance with IS : 2633-1972\* for uniformity and IS : 6745-1972† for weight of zinc coating, and the fitting shall meet the requirements of these specifications.

---

\*Methods of testing uniformity of coating on zinc coated articles (*first revision*).

†Methods of determination of weight of zinc coating on zinc coated iron and steel articles.

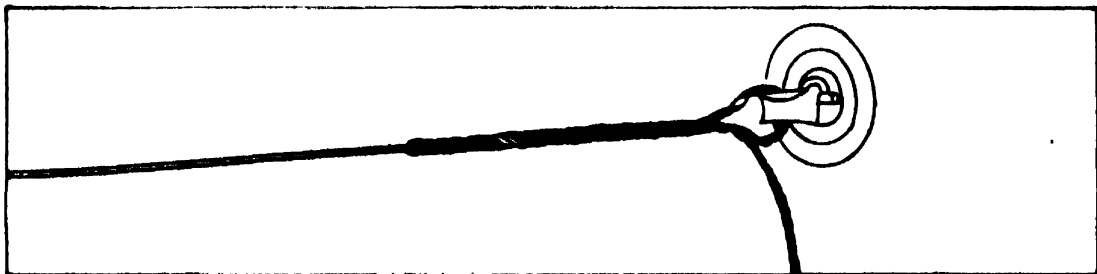
**7.12 Pull-off Strength Test** — This test is intended to simulate the conductor pull-off conditions created by conditions including elevation difference of the supporting structures on the two sides of the tie. A span of minimum 20 metres tensioned for 35 percent of UTS of the conductor shall be erected in the laboratory with a conductor of the specified size with which the fitting is intended to be used. A steel replica of pin insulator along with the insulator tie under test shall be applied in inverted position in the middle of span so that a suitable upward force can be applied on the pin by means of a machine. The pull-off strength of the tie shall not be less than 200 kg.

**7.13 Electrical and Mechanical Tests on Tap Connectors** — These tests shall be carried out on tap connectors in accordance with IS : 5561-1970\*.

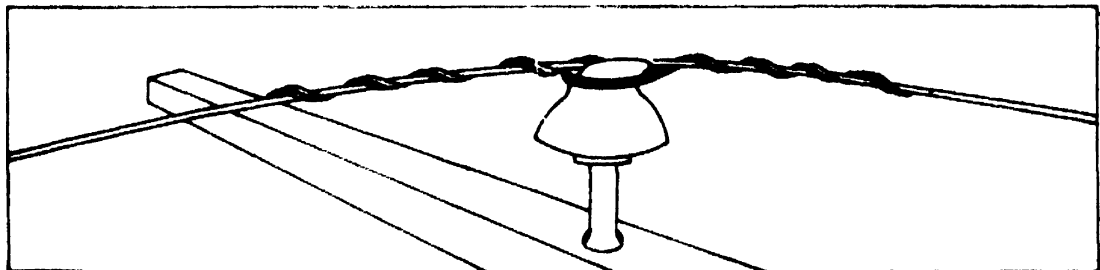
## APPENDIX A

### ILLUSTRATIVE FIGURES REGARDING APPLICATIONS OF HELICALLY FORMED FITTINGS

(Clause 0.3.1)



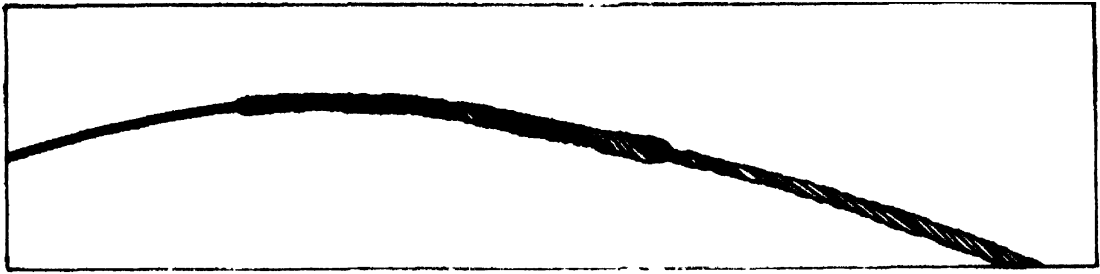
CONDUCTOR DEADEND GRIP H T



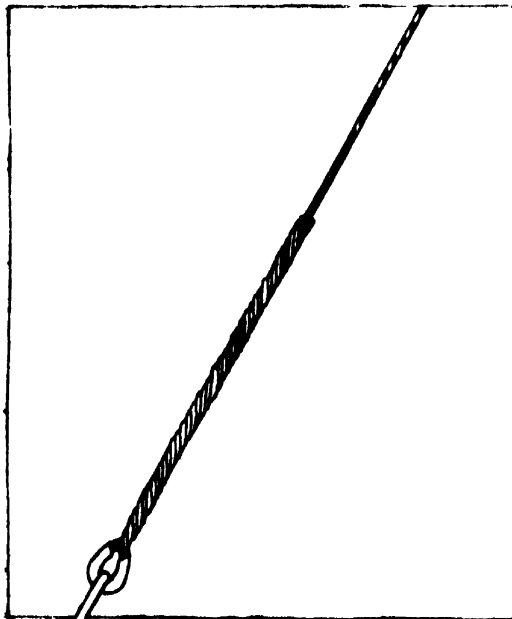
DISTRIBUTION TIE

---

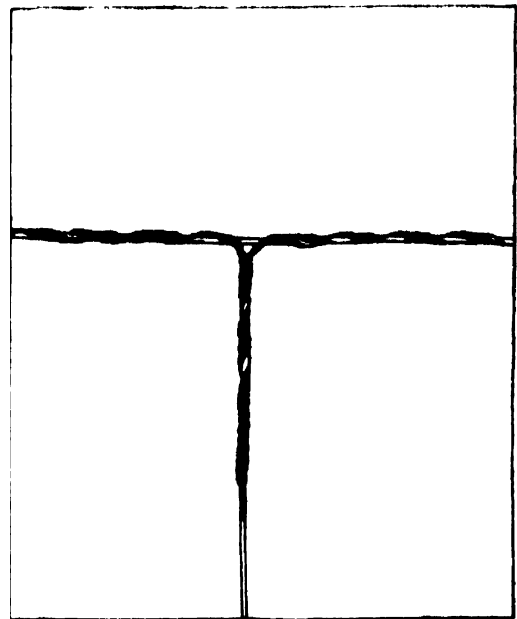
\*Specification for electric power connectors.



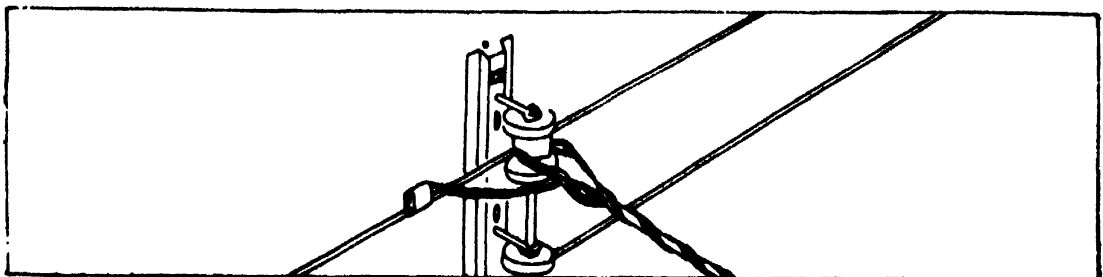
LINE SPLICE



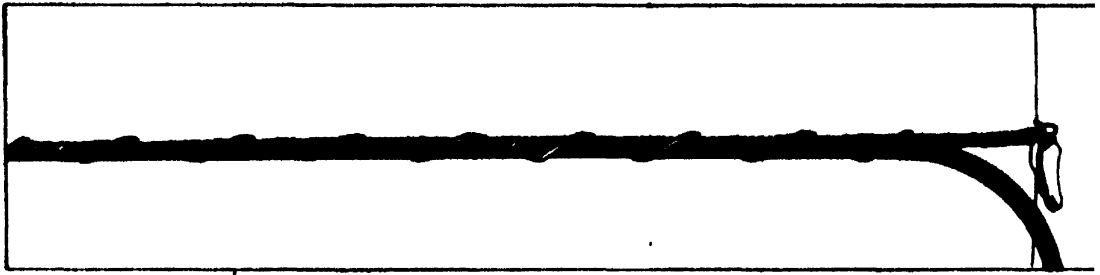
GUY GRIP



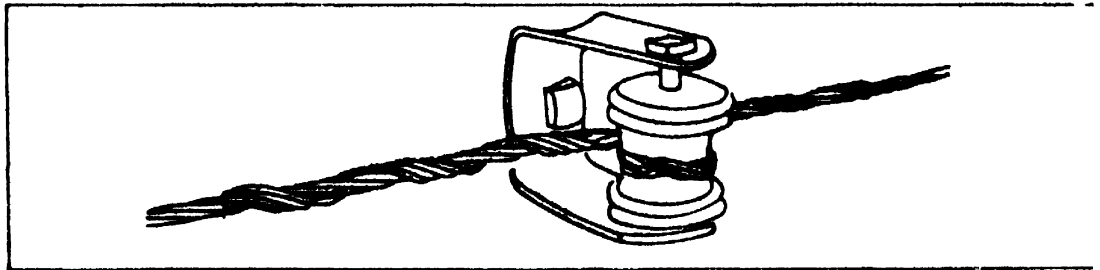
TAP CONNECTOR



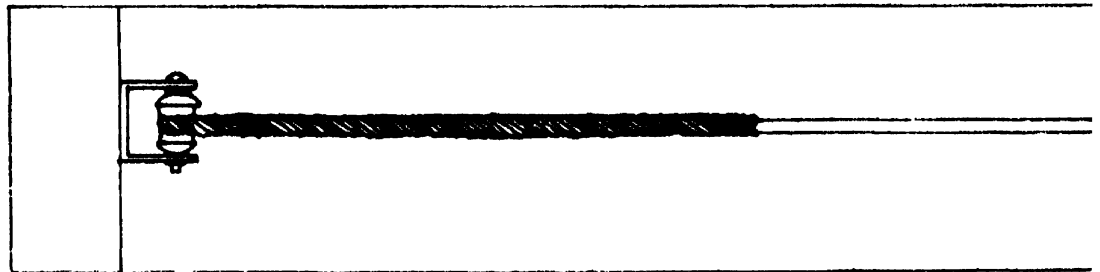
CONDUCTOR GRIP DEADEND L T



LASHING ROD



SIDE TIE L T



SERVICE GRIP DEADEND

## APPENDIX B

*(Clause 7.1.2.3)*

### SAMPLING PROCEDURE FOR HELICALLY FORMED FITTINGS

#### A-1. SCALE OF SAMPLING

**A-1.1 Lot** — In a consignment, all the helically formed fittings of the same size manufactured in the same factory under similar conditions of production shall be grouped together to constitute a lot.

**A-1.2** The number of fittings to be selected from each lot shall depend upon the size of the lot and shall be in accordance with col 1 and 2 of Table 2.

---

**TABLE 2 SAMPLE SIZE AND ACCEPTANCE NUMBER**

LOT SIZE	FOR VISUAL, DIMENSIONAL AND ELECTRICAL RESISTANCE TEST		FOR OTHER ACCEPTANCE TESTS
	sample Size	Acceptance Number	
(1)	(2)	(3)	(4)
Up to 300	13	0	2
301 to 500	20	1	3
501 to 1 000	32	2	5
1 001 and above	50	3	7

**A-1.3** These fittings shall be selected from the lot at random. In order to ensure the randomness of selection, procedures given in IS : 4905-1968\* may be followed.

## **A-2. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY**

**A-2.1** All the fittings covered under this standard and selected at random in accordance with col 1 and 2 of Table 2 shall be subjected to visual examination, dimensional requirements and electrical resistance test. A fitting, failing to meet any of the requirements, shall be termed as defective. The lot shall be considered as conforming to these requirements if the number of defectives is less than or equal to the corresponding acceptance number (*see* col 3 of Table 2), otherwise not.

**A-2.2** The lot, which has been found as conforming to the above requirements, shall then be tested for remaining acceptance tests. For this purpose, the sample size shall be in accordance with col 1 and 4 of Table 2. The lot shall be considered as conforming to these requirements if no defect is found in the sample.

**A-2.3** The lot shall be considered as conforming to the requirements if acceptance tests of **A-2.1** and **A-2.2** are satisfied.

---

\*Methods for random sampling.

## IS : 12048 - 1987

(Continued from page 2)

<i>Members</i>	<i>Representing</i>
SHRI R. T. CHARI CHIEF ENGINEER ELECTRICITY (PROJECTS) SUPERINTENDING ENGINEER TECH (PROJECTS) ( <i>Alternate</i> ) DIRECTOR (TI)	Tag Corporation, Madras Andhra Pradesh State Electricity Board, Hyderabad
SHRI B. N. JHUNJHUNWALA  SHRI P. K. RAY ( <i>Alternate</i> )	Research, Designs and Standards Organization (Department of Railways), Lucknow Modern Malleable Casting Works Pvt Ltd, Calcutta
SHRI H. C. KAUSHIK SHRI S. S. RAO	Haryana State Electricity Board, Chandigarh National Thermal Power Corporation Ltd, New Delhi
SHRI M. K. RATHI	Maharashtra State Electricity Board, Bombay

# BUREAU OF INDIAN STANDARDS

## *Headquarters:*

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones : 3 31 01 31, 3 31 13 75

Telegrams : Manaksanstha  
(Common to all Offices)

## *Regional Offices:*

*Telephone*

\*Western : Manakalaya, E9 MIDC, Marol, Andheri (East), 6 32 92 95  
BOMBAY 400093

†Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, 38 24 99  
Maniktola, CALCUTTA 700054

Northern : SCO 445-446, Sector 35-C, { 2 18 43  
CHANDIGARH 160036 { 3 16 41

Southern : C. I. T. Campus, MADRAS 600113 { 41 24 42  
{ 41 25 19  
{ 41 29 18

## *Branch Offices:*

'Pushpak', Nurmohamed Shaikh Marg, Khanpur, { 2 63 48  
AHMADABAD 380001 { 2 63 49

'F' Block, Unity Bldg, Narasimharaja Square, 22 48 05  
BANGALORE 560002

Gangotri Complex, 5th Floor, Bhadbhada Road, T. T. Nagar, 6 67 16  
BHOPAL 462003

Plot No. 82/83, Lewis Road, BHUBANESHWAR 751002 5 36 27

53/5, Ward No. 29, R. G. Barua Road,  
5th Byelane, GUWAHATI 781003

5-8-56C, L. N. Gupta Marg (Nampally Station Road), 23 10 83  
HYDERABAD 500001

R14 Yudhister Marg, C Scheme, JAIPUR 302005 { 6 34 71  
{ 6 98 32

117/418 B Sarvodaya Nagar, KANPUR 208005 { 21 68 76  
{ 21 82 92

Patliputra Industrial Estate, PATNA 800013 6 23 05

Hantex Bldg (2nd Floor), Rly Station Road, 7 66 37  
TRIVANDRUM 695001

## *Inspection Offices (With Sale Point):*

Pushpanjali, 205-A West High Court Road, 2 51 71  
Bharampeth Extension, NAGPUR 440010

Institution of Engineers (India) Building, 1332 Shivaji Nagar 5 24 35  
PUNE 411005

---

\*Sales Office in Bombay is at Novelty Chambers, Grant Road, 89 65 28  
Bombay 400007

†Sales Office in Calcutta is at 5 Chowringhee Approach P. O. Princep 27 68 00  
Street, Calcutta 700072